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=> d his
     (FILE 'USPAT' ENTERED AT 16:53:41 ON 24 APR 1997)
L1         178169 S 128/CLAS OR 251/CLAS OR 137/CLAS
L2          41678 S L1 AND VALVE
L3           7151 S L2 AND (SECOND STAGE OR DEMAND OR REGULATOR)
L4           2463 S L3 AND (DIAPHRAM OR DIAPHRAGM)
L5            573 S L4 AND LEVER
L6            493 S L5 AND (SEAT OR SEAL)
L7            121 S L6 AND (SEAT OR SEAL)(5A)(FLEXIBLE OR ELAST? OR RUBBER O
R S
L8             18 S L7 AND (SEAT OR SEAL)(5A)(CUT? OR DISTORT? OR MAR OR MAR
RIN
L9             16 S L8 AND (TUBE OR CYLINDER OR SLEEVE)
L10             9 S L9 AND SLEEVE
L11             3 S L10 AND PISTON
=> L
'L' IS NOT A RECOGNIZED COMMAND
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=> d l8 1-18

1. 5,549,107, Aug. 27, 1996, **Second** **stage** scuba diving **regulator**; Dean R. Garraffe, et al., **128/204.26**, **205.24**; **137/906**, **908** [IMAGE AVAILABLE]

2. 5,285,998, Feb. 15, 1994, Internal **valve** for pressure fluid containment vessels; Donald L. Zink, et al., **251/144**; **137/347**, **454.6**, **576**; **251/63.6**, **335.3** [IMAGE AVAILABLE]

3. 5,280,874, Jan. 25, 1994, Internal **valve**; Donald L. Zink, et al., **251/144**, **63.5**, **335.3** [IMAGE AVAILABLE]

4. 5,251,618, Oct. 12, 1993, **Regulator** **second** **stage** for scuba; Tony Christianson, **128/205.24**, **201.28**, **204.26**; **137/494**, **514.7**; **251/251** [IMAGE AVAILABLE]

5. 5,035,238, Jul. 30, 1991, **Regulator** **second** **stage** for scuba; Tony Christianson, **128/204.26**; **137/494**, **855**, **908** [IMAGE AVAILABLE]

6. 4,862,884, Sep. 5, 1989, **Regulator** **second** **stage** for scuba; Tony Christianson, **128/204.26**; **251/254** [IMAGE AVAILABLE]

7. 4,834,086, May 30, 1989, Pressure-regulating device for the **second** **stage** of reduction of an air breathing apparatus; Giovanni Garofalo, **128/205.24**, **204.18**, **204.26**, **207.16** [IMAGE AVAILABLE]

8. 4,794,943, Jan. 3, 1989, Fluid control **valve** assembly; Reno L. Vicenzi, **137/625.44**, **627.5**, **862**, **885**, **903**; **251/61**, **901** [IMAGE AVAILABLE]

9. 4,007,760, Feb. 15, 1977, Fuel control system and control device therefor or the like; Charles D. Branson, et al., **137/614.13** [IMAGE AVAILABLE]

10. 3,989,064, Nov. 2, 1976, Fuel control system and control device therefor or the like; Charles D. Branson, et al., **137/614.11**; 236/15A [IMAGE AVAILABLE]

11. 3,893,475, Jul. 8, 1975, Float **valve**; George D. Hudson, **137/414**, **426**, **428**, **433**, **444**; **251/46** [IMAGE AVAILABLE]

12. 3,876,137, Apr. 8, 1975, CONDITION RESPONSIVE CONTROL DEVICES;

Samuel T. Kelly, et al., 236/48A, 101R; **251/75** [IMAGE AVAILABLE]

13. 3,758,069, Sep. 11, 1973, RIBBON TYPE FLOW CONTROL DEVICE; David E. Whitten, **251/58**; **137/505.46** [IMAGE AVAILABLE]

14. 3,685,732, Aug. 22, 1972, THERMOSTATIC CONTROL DEVICE WITH HEAT MOTOR OPERATED STEP OPEN **DIAPHRAGM** **VALVE**; Lauren D. Haskins, et al., 236/68R; **137/495**; 236/80F, 80R; **251/11** [IMAGE AVAILABLE]

15. 3,656,689, Apr. 18, 1972, MODULATING **VALVE**; Tadeusz Budzich, et al., 237/8A; **137/501**; 236/79, 92R [IMAGE AVAILABLE]

16. 3,623,506, Nov. 30, 1971, SERVICE **REGULATOR** WITH HIGH-LOW PRESSURE CUTOFF DEVICE; Joseph A. Bonner, et al., **137/613**, **461**, **484.4**, **505.46** [IMAGE AVAILABLE]

17. 3,592,225, Jul. 13, 1971, UNITARY CONTROL DEVICE; Marvin M. Graham, et al., **137/495** [IMAGE AVAILABLE]

18. 3,575,343, Apr. 20, 1971, CONDITION RESPONSIVE PARAMETER CONTROL MEANS; Kenneth G. Kreuter, et al., 236/47; **137/110** [IMAGE AVAILABLE]

=> d l9 1-16

1. 5,549,107, Aug. 27, 1996, **Second** **stage** scuba diving **regulator**; Dean R. Garraffe, et al., **128/204.26**, **205.24**; **137/906**, **908** [IMAGE AVAILABLE]

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3. 5,280,874, Jan. 25, 1994, Internal **valve**; Donald L. Zink, et al., **251/144**, **63.5**, **335.3** [IMAGE AVAILABLE]

4. 5,251,618, Oct. 12, 1993, **Regulator** **second** **stage** for scuba; Tony Christianson, **128/205.24**, **201.28**, **204.26**; **137/494**, **514.7**; **251/251** [IMAGE AVAILABLE]

5. 4,862,884, Sep. 5, 1989, **Regulator** **second** **stage** for scuba; Tony Christianson, **128/204.26**; **251/254** [IMAGE AVAILABLE]

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13. 3,656,689, Apr. 18, 1972, MODULATING **VALVE**; Tadeusz Budzich, et al., 237/8A; **137/501**; 236/79, 92R [IMAGE AVAILABLE]

14. 3,623,506, Nov. 30, 1971, SERVICE **REGULATOR** WITH HIGH-LOW PRESSURE CUTOFF DEVICE; Joseph A. Bonner, et al., **137/613**, **461**, **484.4**, **505.46** [IMAGE AVAILABLE]

15. 3,592,225, Jul. 13, 1971, UNITARY CONTROL DEVICE; Marvin M. Graham, et al., **137/495** [IMAGE AVAILABLE]

16. 3,575,343, Apr. 20, 1971, CONDITION RESPONSIVE PARAMETER CONTROL MEANS; Kenneth G. Kreuter, et al., 236/47; **137/110** [IMAGE AVAILABLE]
=> d l10 1-9

1. 5,285,998, Feb. 15, 1994, Internal **valve** for pressure fluid containment vessels; Donald L. Zink, et al., **251/144**; **137/347**, **454.6**, **576**; **251/63.6**, **335.3** [IMAGE AVAILABLE]

2. 5,280,874, Jan. 25, 1994, Internal **valve**; Donald L. Zink, et al., **251/144**, **63.5**, **335.3** [IMAGE AVAILABLE]

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6. 3,656,689, Apr. 18, 1972, MODULATING **VALVE**; Tadeusz Budzich, et al., 237/8A; **137/501**; 236/79, 92R [IMAGE AVAILABLE]

7. 3,623,506, Nov. 30, 1971, SERVICE **REGULATOR** WITH HIGH-LOW PRESSURE CUTOFF DEVICE; Joseph A. Bonner, et al., **137/613**, **461**, **484.4**, **505.46** [IMAGE AVAILABLE]

8. 3,592,225, Jul. 13, 1971, UNITARY CONTROL DEVICE; Marvin M. Graham, et al., **137/495** [IMAGE AVAILABLE]

9. 3,575,343, Apr. 20, 1971, CONDITION RESPONSIVE PARAMETER CONTROL MEANS; Kenneth G. Kreuter, et al., 236/47; **137/110** [IMAGE AVAILABLE]
=> d l11 1-3

1. 5,285,998, Feb. 15, 1994, Internal **valve** for pressure fluid

containment vessels; Donald L. Zink, et al., **251/144**; **137/347**, **454.6**, **576**; **251/63.6**, **335.3** [IMAGE AVAILABLE]

2. 5,280,874, Jan. 25, 1994, Internal **valve**; Donald L. Zink, et al., **251/144**, **63.5**, **335.3** [IMAGE AVAILABLE]

3. 3,758,069, Sep. 11, 1973, RIBBON TYPE FLOW CONTROL DEVICE; David E. Whitten, **251/58**; **137/505.46** [IMAGE AVAILABLE]

US PAT NO: 5,549,107 [IMAGE AVAILABLE] L8: 1 of 18
TITLE: **Second** **stage** scuba diving **regulator**
US-CL-CURRENT: **128/204.26**, **205.24**; **137/906**, **908**

ABSTRACT:
An improved **second** **stage** **regulator** employs a pneumatically-activated anti-set poppet and inhalation resistance adjustment control knob accessible externally of the **regulator**. The anti-set poppet utilizes a pressure-activated compression spring to **seal** the air inlet during exhalation. When the **regulator** is stored, the relaxed spring permits the **seal** to withdraw from the sharp edge orifice of the air inlet thereby avoiding **seal** wear which would otherwise diminish the performance of the **regulator**. The adjustment control knob permits the diver to modify the required cracking effort by changing the amount of spring compression when the **regulator** is pressurized.

In the present invention, when the **second** **stage** **regulator** thereof is unpressurized, such as in periods of storage or non-use, the poppet assembly has little or no force applied to it to press it against the sharp edge orifice. During use, as soon as the interior of the **regulator** is pressurized, the anti-set poppet operates by using incoming air pressure from the first stage to move the poppet assembly. . . working position to make contact with the sharp orifice. In this manner, the sharp orifice only makes contact with the **rubber** **seat** during actual use. This eliminates the deep impressions left by the orifice during periods of non-use. A light or reduced. . . force may remain on the poppet to keep it in the proximity of or just touching the orifice when the **regulator** chamber is unpressurized. A scuba **regulator** with such an anti-set feature will have a longer service

It is therefore a principal object of the present invention to provide an improved **second** **stage** **regulator** for scuba diving, the **regulator** having both an anti-set poppet and an external cracking-effort-control adjustment to permit the diver to vary the cracking effort manually.

It is an additional object of the present invention to provide an improved **second** **stage** **regulator** for scuba diving having a balanced linear flow **demand** **valve** with a pneumatically activated balanced poppet wherein a **soft** **elastomeric** **seal** engages a sharp-edge orifice only when the interior chamber of the **regulator** is pressurized and relaxes the **seal** from the orifice edge when the interior chamber of the **regulator** is unpressurized.

US PAT NO: 4,834,086 [IMAGE AVAILABLE] L8: 7 of 18
TITLE: Pressure-regulating device for the **second** **stage** of reduction of an air breathing apparatus
US-CL-CURRENT: **128/205.24**, **204.18**, **204.26**, **207.16**

ABSTRACT:
A . . . the air-feeding conduit from the first stage of reduction of an air bottle, is provided at one end with a **valve** **seat**. The floating piston member may be displaced between a first operative position, in which it is pushed by air pressure against the **seal** of a **valve** member against the action of a spring, and a second position wherein it is separated and moved away from the **seal** of the **valve** member by the action of the spring. The **valve** member is controlled by the manostat **diaphragm** of the breathing apparatus, through a suitable transmission and is urged constantly toward the **valve** **seat** by a spring.

SUMMARY:

BSUM(2)

This invention relates to a pressure-regulating device which is intended, for example, to equip the **second** **stage** of reduction of a two-stage pressure **regulator** of an air breathing apparatus, particularly an underwater breathing apparatus.

SUMMARY:

BSUM(3)

In the conventional air pressure-regulating devices for the **second** **stage** of reduction of an air breathing apparatus, the **valve** member of the **second**-**stage** **valve** is also urged constantly by a calibrated spring with a considerable force against its **valve** **seat**. This **valve**-closing force is also present when the **valve** is in its rest condition, and in the course of time this causes a permanent **distortion** of the **resilient** **seal** on the **valve** member, which alters the calibration of **valve**.

SUMMARY:

BSUM(4)

Inasmuch . . . operation, it has been proposed, for example, as described in U.S. Pat. No. 4,094,314, to avoid any contact between the **valve** member and **valve** **seat** in the **second**-**stage**

valves during the non-operative periods of the valves, by mounting the **valve** **seat** on a freely-floating member or piston, whereby the **valve** **seat** is matched against the **valve** member only when compressed air is operative upstream of the **valve** **seat**, whereas when the supply of compressed air is discontinued the piston is pushed back into a neutral position due to the **resiliency** of the **seal** on the **valve** member.

SUMMARY:

BSUM(5)

The . . . has some disadvantages and does not always result in a constant and reliable operation. Moreover, the force which matches the **valve** member against its **seat** cannot be adjusted.

SUMMARY:

BSUM(9)

According to its main characteristic, the floating piston of the device which mounts the **valve** **seat**, moves through an exactly-established stroke between an operative position wherein it is pushed by the pressure of the compressed air against the **seal** of the **valve** member, and a rest position, defined by a stop member, wherein the **valve** **seat** is spaced from the **seal** of the **valve** member by the action of a spring to ensure a prompt separation of these two members in any operational condition.. . . to calibrate accurately and in an exactly reproducible manner both the force for matching together the two members, i.e. the **second**-**stage** **valve** **seat** and **valve** member, and the force for separating them.